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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/736,354	12/15/2003	Robert Oliver Buckingham	03485-P0009A	4073
24126	7590	07/17/2006	EXAMINER	
ST. ONGE STEWARD JOHNSTON & REENS, LLC 986 BEDFORD STREET STAMFORD, CT 06905-5619			PILKINGTON, JAMES	
			ART UNIT	PAPER NUMBER
			3682	

DATE MAILED: 07/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/736,354	BUCKINGHAM ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	James Pilkington	3682	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,6-13,15,17-26 and 28-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6-13,15,17-26 and 28-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 December 2005 and 15 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Continued Prosecution Application***

The request filed on June 13, 2006 for Continued Prosecution (RCE) is acceptable and an action on the RCE follows.

### ***Drawings***

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, each wire being passed around a guide or pulley (clm 25), the lubricant reservoir and pump (clm 34) and the lubricant cooling means (clm 35) must be shown or the feature(s) canceled from the claim(s). Currently only 2 cables are being shown passing around a guide or pulley. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New

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Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 4 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification does not provide for the thickness being 3 mm or less. The specification only enables for the thickness to be 1 mm or less, therefore, thickness in the range of 1.001 mm to 3 mm are not enabled for.

4. Claims 34 and 35 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. What structure allows for the recycling of the lubricant, is there a piping system or some other method? What structure allows for the cooling of the lubricant, is there a heat exchanger some place?

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1, 6, 11, 15, 17-25, 30 and 31 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The terms "sufficiently," "effectively" and "substantially" in claims 1, 6 and 11 are relative terms which render the claims indefinite. The terms "sufficiently," "effectively" and "substantially" are not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. For example, what would render something "sufficiently thin" (clm 1), thin enough that it still works? What would render something "effectively secured" (clm 6) and how much movement is allowed by the phrase "substantially no compressive movement"?

Claims 15, and 17-25 recite the limitation "the segment." There is insufficient antecedent basis for this limitation in the claim.

Claims 30 and 31 recite the limitation "the sleeve" (clm 30) and "the sheath" (clm 31). There is insufficient antecedent basis for this limitation in the claim.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims, 1-36, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Stelle, USP 3,266,059, in view of Balczun et al, USP 5,902,050.

Re claim 1, Stelle discloses a link assembly for a robot arm comprising:

- First and second link members (75-80) configured in a cooperating mating relationship
- At least one wire (106 or 108) extending from said first link member to said second member, said at least one wire including a preload so as to maintain said link assembly under compression (Stelle states that all the joints are prestressed (C4/L37-52), if the joints are prestressed and it is the cables that hold the joints together then the cables must be preloaded).

Stelle does not disclose a resilient elastomer disposed between said first and second members and the elastomer is bonded to both of the first and second link members, and is sufficiently thin and maintained under compression.

Balczun teaches a resilient elastomer (plastic) bearing (28 part of spherical bearing 22) disposed between two members (20 and 24) and the elastomer is bonded to both of the first and second link members (C1/L35-38) and is sufficiently thin and maintained under compression (disposed between two elements) for the purpose of providing isolation of transmitted vibrations (C1/L6-10).

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the teachings of Stelle and provide a resilient elastomer bearing disposed between two members and the elastomer is bonded to both of the first and

second link members, and is sufficiently thin and maintained under compression, as taught by Balczun, for the purpose of providing isolation of transmitted vibrations.

**\*\*The examiner notes, regarding the "whereby" clause in clm 1, that it has been held that when a "whereby" clause states a condition that is material to patentability, it cannot be ignored in order to change the substance of the invention." Accordingly, the "whereby" clause in this instance serves to narrow the claim and has been given patentable weight by the examiner. See MPEP 2111.04.\*\***

Re clm 2 and 9, Balczun discloses that the elastomer (28) is made of plastic which is a synthetic rubber and/or a laminate (clm 9).

Re clm 4, well a specific thickness is not disclosed by Balczun it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized a specific thickness range in order to conform to the compressional force inputs, and/or cost specifications of the assembly, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Re clm 6, Balczun discloses each surface of the elastomeric layer contiguous the member is effectively secured (compressed between the members 20 and 24) so that in operation, relative movement between the members produces shear movement within the elastomer, the arrangement being such that the thinness of the layer reduces the tendency towards compression thereby imparting improved stability (reduces vibration) for the positioning of the components.

Re clm 7, Balczun discloses the elastomer means comprising a plurality of layers of elastomer (28 and 32).

Re clm 8, Balczun disclose an interleaving rigid layer (connection between 28 and 32) is bonded to adjacent elastomer layers to separate one layer from its neighbor (C2/L23-42).

Re clm 10, Balczun discloses the interleaving layer between each layer of elastomer (28 and 32) is of a material, which is bondable to or capable of being keyed to the elastomer.

Re clm 11, Balczun discloses that the interleaving layer is sufficiently stiff to reduce compression of the elastomer to a minimum during movement of the linked members (75-80). \*Only the elastomer layers compress\*

Re clm 12 and 13, Balczun discloses that the interleaving layer comprises a metal layer, a resin layer (plastic) or glass fiber, or a mat of either woven or unwoven material. \*As for claim 13 carbon fiber and Kevlar are known woven/unwoven materials\*

Re clm 15, as best understood, Stelle discloses said at least one wire (106 or 108) comprises control means for controlling the movement (the wires are control means connected to a module) of said link assemblies within the segment.

Re clm 17, as best understood, Stelle discloses that the control means comprises 3 wires (not shown in detail but Figure 5 shows multiple holes capable of receiving the wires also see C2/L48-50).

Re clm 18, as best understood, Stelle discloses that the wires (106, 108) are tensioned to maintain the links under compression, the arrangement being such that



application of differential tension between the wires causes or allows the segment to move or bend.

Re clm 19, as best understood, Stelle in view of Balczun discloses that the first link member comprises an outer disc (98) having holes for control wires (Figures 5 and 6) and the second link member comprises an inner disk (88) which is adapted to be disposed generally inwardly of the outer disc (98) and which has a central bore (94) which has a bore to accommodate at least one of control and power means (100) for the work head and a rubber disc layer (Balczun).

Re clm 20, as best understood, Stelle discloses a plurality of said segments (75-80) in which control means is provided for each segment.

Re clm 21, as best understood, Stelle discloses each segment terminates in an end cap having wire conduit means for the control wires of other segments of the arm and anchorage means arcuately spaced about the cap for securing the control wires for the segment in question (Figure 6).

Re clm 22, as best understood, Stelle discloses at least one of the members of each link is provided with means for guiding the wires from one end of the segment to the other (the holes).

Re clm 23, as best understood, Stelle discloses each wire is disposed externally of the segment links and terminates in a ferrule (110, 112).

Re clm 24, as best understood, Stelle discloses that each control wire is operated by an actuator (C3/L3-17).

Re clm 25, as best understood, Stelle discloses each that each cable is provided with an actuator. Also, it would have been obvious to one of ordinary skill in the art at the time of the invention to pass the cables around pulleys to help align the cables before entering the segment.

Re clm 26, Stelle discloses each link is produced as a pair of half links which permit back to back assembly, the arrangement being such that an inner link (88) and an outer link (98) may be assembled with its associated bonding layer to form unitary link components (75-80), a plurality of which together can be assembled to form a segment.

Re clm 28, Stelle discloses locating dowels (rounded portion of 88) provided in mating holes (90).

Re clms 29 and 30, Stelle discloses an external sleeve (86) which is a bellows-type sheath (see Figure 4).

Re clm 31, Stelle discloses that the sheath comprises a material and a configuration which is selected to increase the tortional stiffness of the arm (rib portions can only compress until the contact one another).

Re clms 32 and 33, the sleeve is capable of being filled with a lubricant.

Re clm 36, Stelle discloses a link assembly for a robot arm comprising:

- First and third link members (75-80) having respectively adjacent spherical surfaces (88, 90) formed to fit together
- At least one wire (106 or 108) extending from said first link member to said third member said at least one wire including a preload so as to maintain

said link assembly under compression (Stelle states that all the joints are prestressed (C4/L37-52), if the joints are prestressed and it is the cables that hold the joints together then the cables must be preloaded).

Stelle does not disclose a resilient elastomer disposed between said first and second members and the elastomer is bonded to both of the first and second link members, and is sufficiently thin and maintained under compression.

Balczun teaches a resilient elastomer (plastic) bearing (28 part of spherical bearing 22) disposed between two members (20 and 24) and the elastomer is bonded to both of the first and second link members (C1/L35-38) and is sufficiently thin and maintained under compression (disposed between two elements) for the purpose of providing isolation of transmitted vibrations (C1/L6-10).

Upon the combination said adjacent spherical surfaces of said first, second and third link members are keyed or bonded to one another such that during articulation of the arm said third link (28, Balczun) rotates about a point of rotation relative to said first link and the distance between the spherical surfaces (88, 90) of said first and third links remains substantially constant; and said elastomeric material is maintained under compression by said at least one wire such that substantially no compressive deformation of said elastomeric material occurs during rotation.

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the teachings of Stelle and provide a resilient elastomer bearing disposed between two members and the elastomer is bonded to both of the first and

second link members, and is sufficiently thin and maintained under compression, as taught by Balczun, for the purpose of providing isolation of transmitted vibrations.

**Also:**

9. Claims 1-2, 4, 6-13, 15-26, 28-31 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stelle (US Pat. 3,266,059) in view of Raines (US Pat. 5,297,874).

Stelle (US Pat. 3,266,059) discloses a robot arm link assembly (fig. 6) comprising first and second link members (75-80) each adapted for limited movement one with respect to the other and resilient means disposed between said first and second member characterized in that the first and second members are configured in a cooperating mating relationship and at least one wire (106, 108) extending from the links.

However, Stelle (US Pat. 3,266,059) doesn't disclose a plurality of thin layered polymide (elastomer, Kevlar, ect.) placed between the links.

Raines (US Pat. 5,297,874) discloses a thin plurality of elastomeric layers (polymides, Kevlar, etc.) forming a bearing surface between relatively movable parts. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the bearing structure of Raines (US Pat. 5,297,874) between the links of Stelle (US Pat. 3,266,059) so as to protect the links from overstress due to outside stimuli, as suggested by Raines (US Pat. 5,297,874).

Furthermore, while a specific thickness is not disclosed by Raines (US Pat. 5,297,874) it would have been obvious to one having ordinary skill in the art at the time

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the invention was made to have utilized a specific thickness range in order to conform to the compressional force inputs, and/or cost specifications of the assembly, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Additionally, the method by which the elastomeric layer(s) are adhered to the links is a product-by-process recitation, therefore the layer(s) of Raines (US Pat. 5,297,874) must only be theoretically capable to such a procedure, which they are.

Finally, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the first and second links separable from one another and halved from themselves so as to allow for easier fabrication (draft angles of molding or casting), since it has been held that constructing a formerly integral structure in various elements involves only routine skill in the art. *Nerwin v. Erlichman*, 168 USPQ 177, 179.

10. Claims 32-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stelle (US Pat. 3,266,059) in view of Raines (US Pat. 5,297,874) as applied to claims 1-13 and 14-31 above, and further in view of Birchard (US Pat. 4,751,821).

Stelle (US Pat. 3,266,059) discloses the claimed invention except for a lubricant cooling means for the robot.

Birchard (US Pat. 4,751,821) discloses a lubricant cooling means for a snake-like robot.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the lubricant cooling means of Birchard (US Pat. 4,751,821) within Stelle (US Pat. 3,266,059) so as to allow for supplementary actuation of the snake robot assembly.

### ***Response to Arguments***

11. Applicant's arguments filed June 13, 2006 have been fully considered but they are not persuasive.

12. Applicant also argues that Stelle fails to teach an elastomeric material and that the cable is used to preload the link members. The examiner would like to point out that Stelle is not being used to teach an elastomeric material, Raines is being used to teach the material, and the cable of Stelle is capable of being used to preload the link members.

13. Applicant argues that Raines does not disclose a thin plurality of elastomeric layers. The examiner disagrees as the Raines reference discloses that the elastomeric bearing comprises a plurality of thin layers (15) (see Figure 2).

14. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the Raines

reference is a bearing surface, and bearing surfaces are ubiquitous to most mechanical devices, therefor to utilize its teaching within Stelle is obvious and proper and motivation has been provided. Furthermore, Raines only discloses an intended use for his elastomeric bearing, and clearly states that it is not exclusively for use in heavy-duty environments (C1/L8-11) and Raines also discloses that elastomeric bearings are known for being used between annular elements (C1/L21-55).

15. Applicant also argues that no shear movement is present in the disclosed reference. The examiner disagrees since shear movement is a movement in which a surface overcomes friction to slide upon another. At least one link member has to be capable of shear movement or the device would not move as the link members would be locked to one another. If there was no shear movement it would be the same as saying that the elastomeric bearing is permanently fixed to the joining link members and can only respond to compression forces.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The other cited documents disclose different robotic arm arrangements.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Pilkington whose telephone number is (571) 272-5052. The examiner can normally be reached on Monday-Friday 8:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Ridley can be reached on (571) 272-6917. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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7/10/06

A handwritten signature in black ink, appearing to read 'Richard Ridley', is positioned above the printed name and title.

RICHARD RIDLEY  
SUPERVISORY PATENT EXAMINER